WHAT IS CLAIMED IS:

1. A thin film measuring apparatus integrated into a thin film deposition system comprising:

a sealed thin film deposition furnace comprising a X-ray permeable X-ray incidence window and X-ray extraction window;

thin film substance generating means for generating thin film deposition particles of a thin film substance in the thin film deposition furnace; and

substrate supporting means for supporting a thin film deposition substrate in the thin film deposition furnace at a position for allowing the thin film deposition particles of the thin film deposition substance generated from the thin film substance generating means to adhere on the surface of the substrate,

the thin film measuring apparatus comprising:

a X-ray irradiation unit for irradiating a X-ray through the X-ray incidence window toward the surface of the thin film deposition substrate supported in the thin film deposition furnace; and

a X-ray sensing unit for sensing the X-ray reflected from the thin film deposition substrate through the X-ray extraction window,

the X-ray irradiation unit comprising a X-ray source

for emitting a divergent X-ray, and a curved monochromator for at least converting the divergent X-ray emitted from the X-ray source into a monochromatic X-ray and for allowing the monochromatic X-ray to converge on the thin film deposition surface of the thin film deposition substrate.

2. A thin film measuring apparatus according to Claim 1 comprising a X-ray measurement apparatus for measuring a rocking curve using as a measuring object a thin film having a mixed crystal structure or a superlatice structure formed on the surface of the thin film deposition substrate having a known Bragg's angle,

the X-ray irradiation unit having a mean X-ray incident angle for a allowing the X-ray to impinge on the thin film on the surface of the thin film deposition substrate with an angle set at around the known Bragg's angle.

3. A thin film measuring apparatus according to Claim 1 comprising a X-ray measurement apparatus for measuring X-ray reflectivity,

wherein the X-ray irradiation unit has a X-ray incident angle for a allowing the X-ray to impinge on the thin film on the surface of the thin film deposition

substrate with an angle set at a low angle range required for measuring X-ray reflectivity.

4. A thin film measuring apparatus according to Claim 1 comprising a control unit for controlling, by previously storing desired basic information for forming a thin film in the thin film deposition furnace, at least deposition and measurement of the thin film formed on the surface of the thin film deposition substrate based on the basic information.

5. A thin film measuring method using the thin film measuring apparatus according to Claim 4, wherein measuring intervals with the thin film measuring apparatus is shortened based on the basic information as deposition of the thin film comes to its end.

6. A thin film deposition system comprising:

a closed thin film deposition furnace having a X-ray permeable X-ray incidence window and X-ray extraction window;

thin film substance generating means for generating thin film deposition particles of the thin film substance in the thin film deposition furnace;

substrate supporting means for supporting a thin film

deposition substrate in the thin film deposition furnace at a position for allowing the thin film deposition particles of the thin film deposition substance generated from the thin film substance generating means to adhere on the surface of the substrate;

a X-ray irradiation unit provided at the outside of the thin film deposition furnace and irradiating a X-ray through the X-ray incidence window toward the surface of the thin film deposition substrate supported in the thin film deposition furnace; and

a X-ray sensing unit provided at the outside of the thin film deposition furnace and sensing the X-ray reflected from the thin film deposition substrate through the X-ray extraction window,

the X-ray irradiation unit comprising a X-ray source for emitting a divergent X-ray, and a curved monochromator for at least converting the divergent X-ray emitted from the X-ray source into a monochromatic X-ray and for allowing the monochromatic X-ray to converge on the thin film deposition surface of the thin film deposition substrate.

7. A thin film deposition system according to Claim 6 wherein, on the premise that the rocking curve is measured based on the data from the X-ray sensing unit using as a

measuring object a thin film having a mixed crystal structure or superlattice structure formed on the surface of the thin film deposition substrate having a known Bragg's angle, the X-ray irradiation unit has a mean X-ray incident angle for a allowing the X-ray to impinge on the thin film on the surface of the thin film deposition substrate with an angle set at around the known Bragg's angle.

8. A thin film deposition system according to Claim 6 wherein, on the premise that X-ray reflectivity is measured, the X-ray irradiation unit has a X-ray incident angle for allowing the X-ray to impinge on the thin film on the surface of the thin film deposition substrate with an angle set at a low angle range required for measuring X-ray reflectivity.

9. A thin film deposition system according to Claim 6 comprising a control unit for controlling, by previously storing desired basic information for forming a thin film in the thin film deposition furnace, at least deposition and measurement of the thin film formed on the surface of the thin film deposition substrate based on the basic information.

10. A thin film deposition system comprising:

a sealed thin film deposition furnace;

thin film substance generating means for generating thin film deposition particles of the thin film substance in the thin film deposition furnace;

substrate supporting means for supporting a thin film deposition substrate in the thin film deposition furnace at a position for allowing the thin film deposition particles of the thin film deposition substance generated from the thin film substance generating means to adhere on the surface of the substrate;

a measuring unit provided at a prescribed site communicating with the thin film deposition furnace, and being capable of disposing the thin film deposition substrate that serves as a thin film deposition sample substrate as a measuring object at a position for allowing the thin film deposition particles of the thin film substance flowing in from the thin film deposition furnace to adhere on the substrate;

a X-ray incidence window and extraction window provided on the side walls of the measuring unit;

a X-ray irradiation unit provided at the outside of the thin film deposition furnace and irradiating a X-ray through the X-ray incidence window toward the surface of the thin film deposition sample substrate disposed within

the measuring unit; and

a X-ray sensing unit provided at the outside of the thin film deposition furnace and sensing the X-ray reflected from the thin film deposition sample substrate through the X-ray extraction window,

the X-ray irradiation unit comprising a X-ray source for emitting a divergent X-ray, and a curved monochromator for at least converting the divergent X-ray emitted from the X-ray source into a monochromatic X-ray and for allowing the monochromatic X-ray to converge on the thin film deposition surface of the thin film deposition sample substrate.

11. A thin film deposition system according to Claim 10 comprising exchange means for a thin film deposition sample substrate for exchanging the thin film deposition sample substrate or the surface thereof disposed in the measuring unit without changing the atmosphere in the thin film deposition furnace.

12. A thin film deposition system according to Claim 10 wherein, on the premise that the rocking curve is measured as a measuring object based on the data from the X-ray sensing unit using a thin film having a mixed crystal structure or superlattice structure formed on the surface

of the thin film deposition substrate having a known Bragg's angle, the X-ray irradiation unit has a mean X-ray incident angle for a allowing the X-ray to impinge on the thin film on the surface of the thin film deposition substrate with an angle set at around the known Bragg's angle.

13. A thin film deposition system according to Claim 10 wherein, on the premise that X-ray reflectivity is measured, the X-ray irradiation unit has a X-ray incident angle for allowing the X-ray to impinge on the thin film on the surface of the thin film deposition substrate with an angle set at a low angle range required for measuring X-ray reflectivity.

14. A thin film deposition system according to Claim 10 comprising a control unit for controlling, by previously storing desired basic information for forming a thin film in the thin film deposition furnace, at least forming of the thin film and measurement of the thin film formed on the surface of the thin film deposition substrate based on the basic information.
thin film deposition and thin film measurement

15. A thin film deposition system comprising:

a sealed thin film deposition furnace having a X-ray permeable X-ray incidence window and X-ray extraction window;

thin film substance generating means for generating thin film deposition particles of the thin film substance in the thin film deposition furnace;

substrate supporting means for supporting a thin film deposition substrate in the thin film deposition furnace at a position for allowing the thin film deposition particles of the thin film deposition substance generated from the thin film substance generating means to adhere on the surface of the substrate;

a shield member facing the surface of the thin film deposition substrate supported in the thin film deposition furnace;

a thin film deposition opening formed at a part of the shield member and for allowing a part of the thin film deposition substrate to expose so that the thin film deposition particles of the thin film deposition substance generated from the thin film substance generating means are adhered on the exposed part;

a sample thin film deposition opening formed at another part of the shield member and for allowing another part of the thin film deposition substrate to expose so that the thin film deposition particles of the thin film

deposition substance generated from the thin film substance generating means are adhered on the another exposed part;

rotary drive means for relatively changing a part of the surface facing the sample thin film deposition opening by allowing the thin film deposition substrate to rotate;

a X-ray irradiation unit disposed at the outside of the thin film deposition furnace and irradiating a X-ray through the X-ray incidence window and the sample thin film deposition opening toward a part of the surface of the thin film deposition substrate supported in the thin film deposition furnace; and

a X-ray sensing unit disposed at the outside of the thin film deposition furnace and sensing the X-ray reflected from a part of the surface of the thin film deposition substrate through the sample thin film deposition opening and the X-ray extraction window,

the X-ray irradiation unit comprising a X-ray source for emitting a divergent X-ray, and a curved monochromator for at least converting the divergent X-ray emitted from the X-ray source into a monochromatic X-ray and for allowing the monochromatic X-ray to converge on the thin film deposition surface of the thin film deposition sample substrate.

16. A thin film deposition system according to Claim

15, wherein the rotary drive means allows the thin film deposition substrate to rotate for every each or plural processes for depositing each thin film layer formed on a part of the surface of the thin film deposition substrate through the thin film deposition opening, in order to change a part of the surface facing the opening for the sample thin film deposition substrate.

17. A thin film deposition system according to Claim 15 wherein, on the premise that the rocking curve is measured based on the data from the X-ray sensing unit using as a measuring object a thin film having a mixed crystal structure or superlattice structure formed on the surface of the thin film deposition substrate having a known Bragg's angle, the X-ray irradiation unit has a mean X-ray incident angle for allowing the X-ray to impinge on the thin film on the surface of the thin film deposition substrate with an angle set at around the known Bragg's angle.

18. A thin film deposition system according to Claim 15 wherein, on the premise that X-ray reflectivity is measured, the X-ray irradiation unit has a X-ray incident angle for allowing the X-ray to impinge on the thin film on the surface of the thin film deposition substrate with an

angle set at a low angle range required for measuring X-ray reflectivity.

19. A thin film deposition system according to Claim 15 comprising a control unit for controlling, by previously storing desired basic information for forming a thin film in the thin film deposition furnace, at least forming of the thin film and measurement of the thin film formed on the surface of the thin film deposition substrate based on the basic information.